OBSTETRICS AIRWAY MANAGEMENT

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INTRODUCTION:-

> The difficult airway is a clinical situation which includes either difficulty with mask ventilation ,laryngoscopy or tracheal intubation

> Obstetric patients are at increased risk of failed tracheal intubation during obstetric GA because of number of clinical factors.

> Difficult or failed intubations will occur, and the only safe way to manage them is to be well prepared

Airway Changes in Pregnancy – Mucosal & Vascular

Mucosal Edema

- Capillary engorgement → edema of entire airway from nose to vocal cords
- Worsens with fluid administration, pre-eclampsia, Valsalva, lithotomy position
- Friable mucosa: minor trauma → significant bleeding

Nasal Changes

- Nasal congestion in >30% of pregnancies (hormonal rhinitis)
- Nasotracheal intubation RELATIVELY CONTRAINDICATED – risk of epistaxis

Laryngeal Changes

- Vocal cords: edema reduces the glottic aperture
- Mallampati class increases by ≥1 grade as pregnancy advances
- Worsens in active labor – Mallampati may increase intrapartum

Breast Enlargement

- Engorged breasts hinder laryngoscope handle manipulation
- Short-handled or video laryngoscope preferred
- Ramping position essential

Respiratory Physiology Changes Relevant to Airway Management

Parameter	Change	Clinical Impact
FRC	↓ 20–30%	Faster desaturation on apnea
O_2 Consumption	↑ 20%	Compounded with ↓FRC
Minute Ventilation	↑ 50%	Compensatory respiratory alkalosis
$PaCO_2$	↓ to 30–32 mmHg	Baseline hypocapnia; apnea worsens
Tidal Volume	↑ 45%	Increased dead space with ETT
Safe Apnea Time	↓ to 3–4 min	Urgent need for rapid intubation

Indication of general anesthesia

- Emergency (category 1) cesarean delivery because there is immediate threat of fetal or maternal death
- Maternal refusal of regional anesthesia
- Previous traumatic experience with regional anesthesia or cesarean delivery

Anatomical abnormalities

- severe scoliosis
- extensive lumbar surgery
- certain spinal muscular disorders

Uncooperative patient

- Recent eclamptic seizure
- drug intoxication
- severe needle phobia

OTHER INDICATIONS:

- Maternal hemorrhage
- Coagulopathy
- Uterine rupture
- Fetal bradycardia
- Maternal trauma

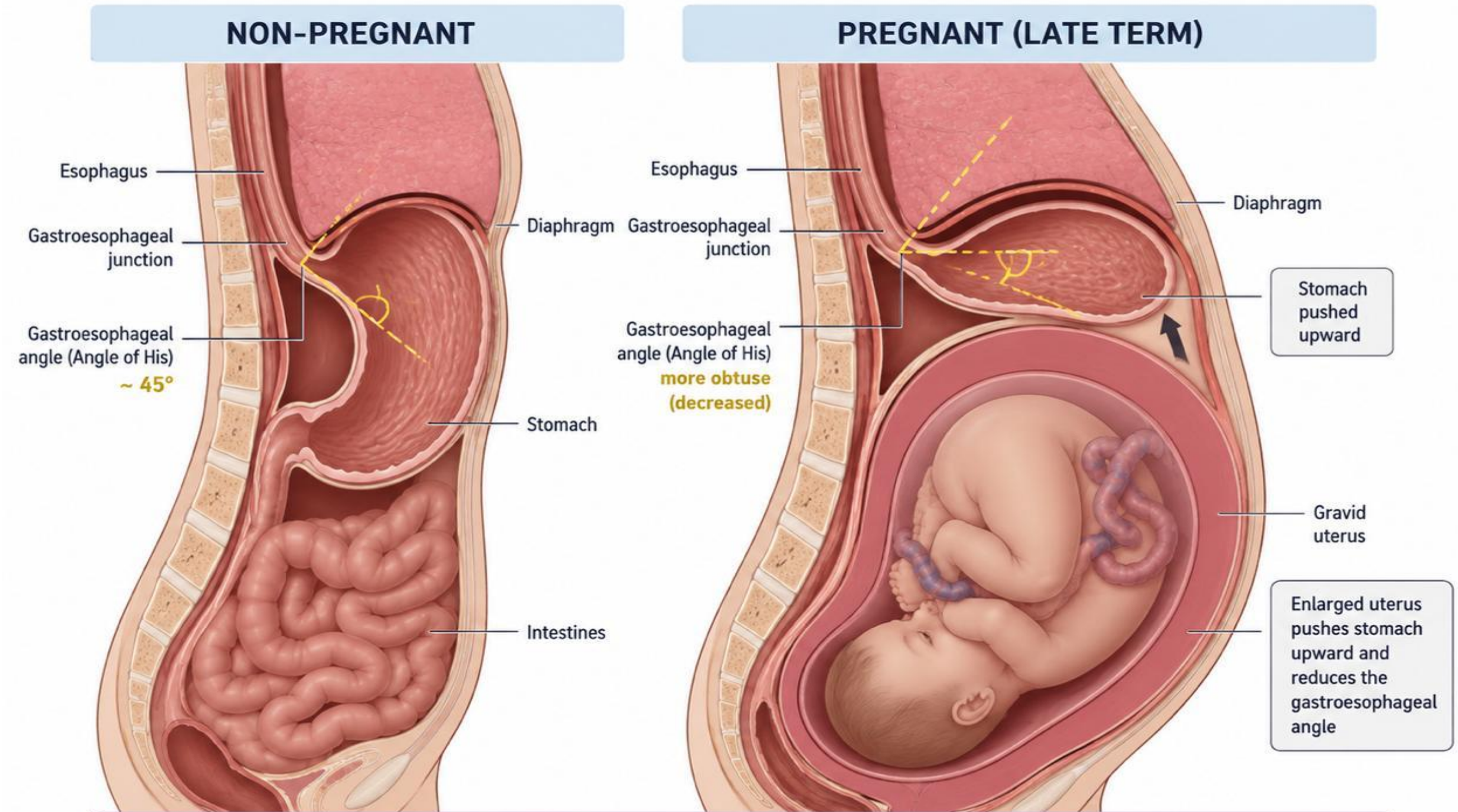
Advantages:

- Rapid onset
- Controlled airway
- Controlled ventilation
- Hemodynamic control
- Reduces maternal psychological stress

ASPIRATION RISK:-

Pregnant women in labor should always be considered to have a full stomach irrespective of the time of their last meal.

- **Upward & anterior displacement of the stomach** by the uterus leads to increase in intragastric pressure
- Gastric emptying time is **slower** and hence gastric volume is increased.
- Opioids further increase the gastric emptying time.
- Reduction of lower esophageal sphincter pressure and decrease gastrointestinal motility and food absorption → increases **risk of regurgitation and aspiration of gastric contents.**


NON-PREGNANT
Esophagus
Gastroesophageal junction
Diaphragm
Gastroesophageal angle (Angle of His)
~ 45°
Stomach
Intestines
PREGNANT (LATE TERM)
Esophagus
Diaphragm
Gastroesophageal junction
Gastroesophageal angle (Angle of His)
more obtuse (decreased)
Stomach pushed upward
Gravid uterus

Enlarged uterus pushes stomach upward and reduces the gastroesophageal angle

During late pregnancy and labor:

- **The gravid uterus increases intra-abdominal pressure.**
- **The stomach is pushed upward.**
- **The gastroesophageal angle (Angle of His) becomes more obtuse (decreases).**
- **This reduces the anti-reflux barrier and increases risk of gastroesophageal reflux and aspiration.**

Aspiration Prophylaxis in Obstetric Anaesthesia

Drug / Class	Common Drug	Typical Dose	Main Purpose	Important Notes
Non-particulate antacid	Sodium citrate (Bicitra)	30 mL PO	Rapidly increases gastric pH	Given 15–30 min before induction
H2 receptor blocker	Ranitidine	50 mg IV	Reduces gastric acid secretion and volume	Faster onset than PPIs
H2 receptor blocker	Famotidine	20 mg IV	Decreases gastric acidity	Alternative to ranitidine
Proton pump inhibitor (PPI)	Pantoprazole	40 mg IV	Strong acid suppression	Slower onset; useful in elective/high-risk cases
Prokinetic agent	Metoclopramide	10 mg IV	Increases LES tone and promotes gastric emptying	Helpful in laboring/opioid-treated patients
Antiemetic	Ondansetron (Emeset)	4 mg IV	Prevents nausea and vomiting	Adjunct only; not primary aspiration prophylaxis

Emergency Caesarean Section — Aspiration Prophylaxis Regimen

Drug	Dose
Sodium citrate	30 mL PO
Pantoprazole OR Ranitidine	Pantoprazole 40 mg IV OR Ranitidine 50 mg IV
Metoclopramide	10 mg IV
Ondansetron	4 mg IV

Predictors of Difficult Airway in Obstetric Patients

Clinical Predictors (LEMON Assessment)

L **Look externally**

Obesity, short neck, receding mandible, macroglossia

E **Evaluate 3-3-2**

<3 finger mouth, <3 finger hyomental distance, <2 hyothyroid

M **Mallampati**

Class III/IV — especially if assessed in labor

O **Obstruction**

Pre-eclampsia edema, epiglottitis, neck mass

N **Neck mobility**

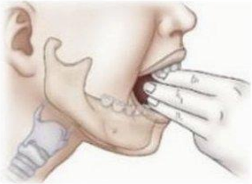
Decreased in obesity, pre-eclampsia, rheumatoid

Obstetric-Specific Risk factors

- Obesity (BMI >35) — prevalence ↑ in obstetric population
- Pre-eclampsia →upper airway edema, worsens rapidly
- Mallampati class worsens with labor (pushes fluids into airway)
- Emergency surgery → inadequate fasting, time pressure

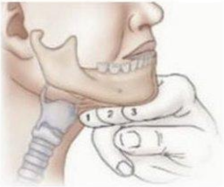
3-3-2 & TMD Assessment

The 3-3-2 rule and measures 3 different distances using fingers. Thyromental distance (TMD) evaluates from the mandible to thyroid cartilage. These aid in predicting the ease or difficulty of intubation.



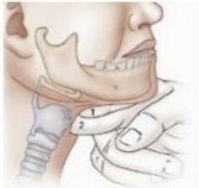
Interincisor space

Desirable:
3+ finger breadths



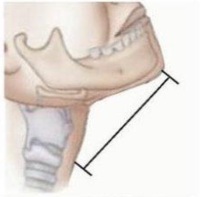
Hyoid-mental distance

Desirable:
3+ finger breadths



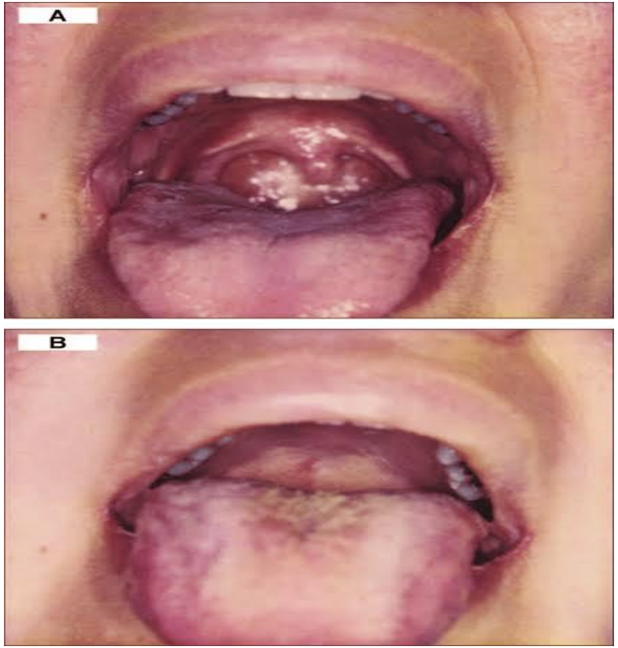
Hyoid-thyroid distance

Desirable:
2+ finger breadths



Thyromental distance

Desirable:
> 6.5 cm with neck extended



Optimisation Techniques at Each Attempt

Position

- Ramped position: external auditory meatus level with sternal notch
- Elevate head 20–30° (reduces aspiration risk, improves laryngoscopy)
- Left uterine displacement

Blade & Equipment

- DL: Macintosh size 3 or 4;
- Video laryngoscope (VL): McGrath, GlideScope, C-MAC
- Short-handle laryngoscope for large breasts

External Laryngeal Manoeuvres

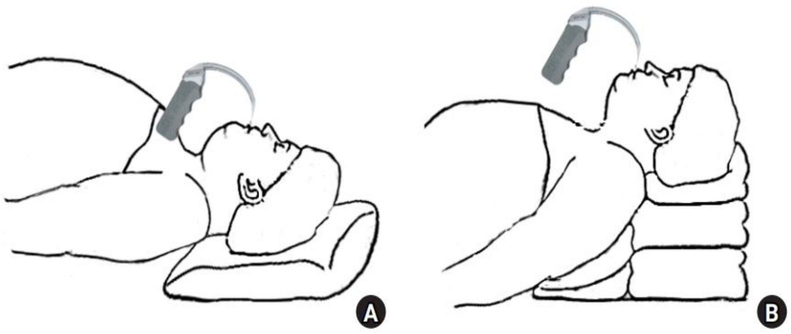
Cricoid Pressure-Compresses oesophagus against C6 vertebra → prevents passive regurgitation. Selick manoeuvre

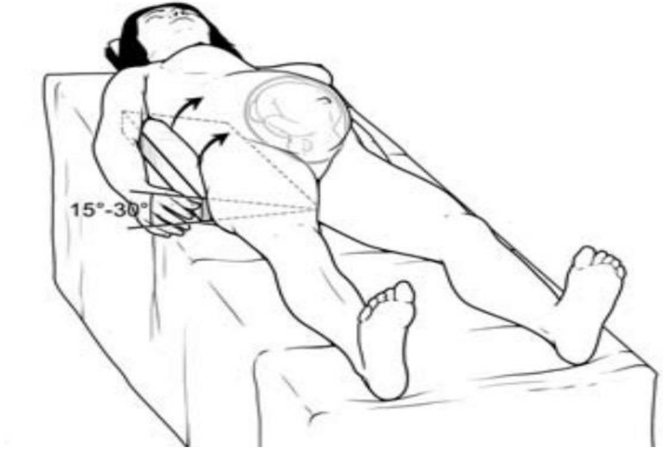
Tube Selection

- Use smaller ETT (6.0–6.5 mm ID) — accommodates laryngeal oedema
- Stylet with mild anterior curve for anterior larynx
- Intubating LMA (Fastrach)

Operator Strategies

- Limit each attempt to 30 seconds
- Maximum 3 attempts


A
B


15°-30°

Pre-oxygenation Strategies

- Goal: $SpO_2 \geq 98\%$, (denitrogenation)
- Technique: 100% O_2 via tight-fitting mask, 3 min tidal volume breathing OR 8 vital capacity breaths in 1min or 4 vital capacity breaths in 30 sec
- Position: 25° head-up (reverse Trendelenburg) / ramped — reduces FRC deterioration & improves laryngoscopy view
- High-flow nasal O_2 (HFNO) 60 L/min during laryngoscopy extends safe apnea time (transnasal humidified rapid insufflation — THRIVE)
- Cricoid pressure (10N awake → 30N after LOC)

Modified RSI Steps

- Pre-oxygenation (3-5 min)
- Ramped position + HFNO commenced
- Cricoid pressure (10N awake → 30N after LOC)
- Propofol 1-2 mg/kg OR Thiopental 4-5 mg/kg
- Succinylcholine 1.5 mg/kg OR Rocuronium 1.2 mg/kg
- Intubate when fasciculations complete (30-60 s)
- Confirm ETT with capnography
- Inflate cuff → release cricoid
- nasogastric tube insertion

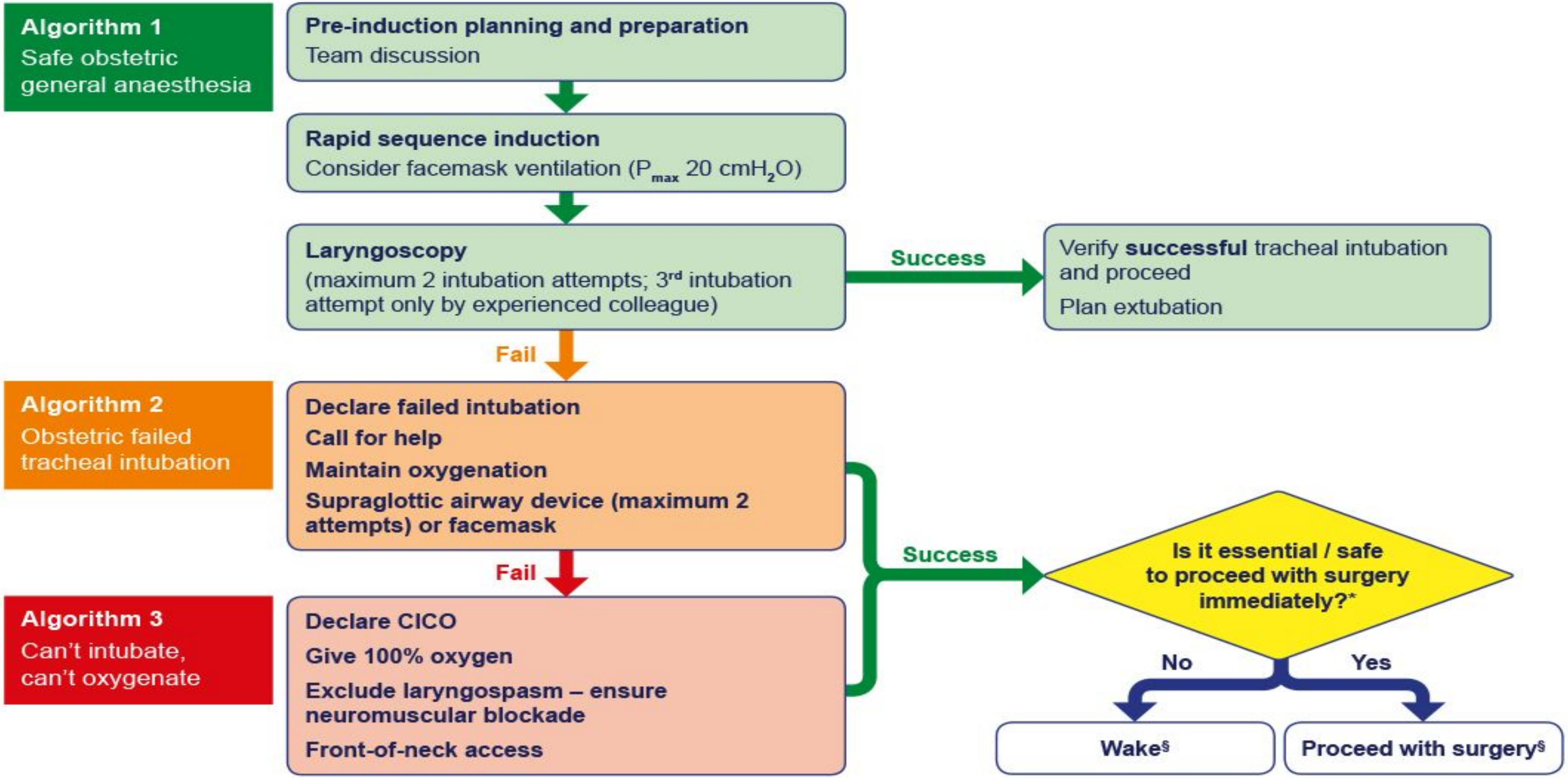
Maintenance of anesthesia:

- Anesthetic requirements as measured by minimal alveolar concentration (MAC), are decreased by **30%** from the nonpregnant state.
- Use of only volatile anesthetics at higher concentration is associated with increased blood loss secondary to uterine atony because **all volatile anesthetics negatively impact uterine contraction.**
- If large concentration administered for a prolonged time, neonatal flaccidity, cardiorespiratory depression and decreased tone may be anticipated

Post cesarean pain control and recovery:

1. Patient controlled analgesia method
2.Neuraxial analgesia method
3.Paracetamol
4.Non Steroidal anti inflammatory drugs
5 Opioids

Master algorithm – obstetric general anaesthesia and failed tracheal intubation



Algorithm 1
Safe obstetric general anaesthesia

Pre-induction planning and preparation
Team discussion

Rapid sequence induction
Consider facemask ventilation (P_{max} 20 cmH_2O)

Laryngoscopy
(maximum 2 intubation attempts; 3rd intubation attempt only by experienced colleague)

Success

Verify **successful** tracheal intubation and proceed

Plan extubation

Fail

Algorithm 2
Obstetric failed tracheal intubation

Declare failed intubation

Call for help

Maintain oxygenation

Supraglottic airway device (maximum 2 attempts) or facemask

Fail

Algorithm 3
Can't intubate, can't oxygenate

Declare CICO

Give 100% oxygen

Exclude laryngospasm – ensure neuromuscular blockade

Front-of-neck access

Success

Is it essential / safe to proceed with surgery immediately?*

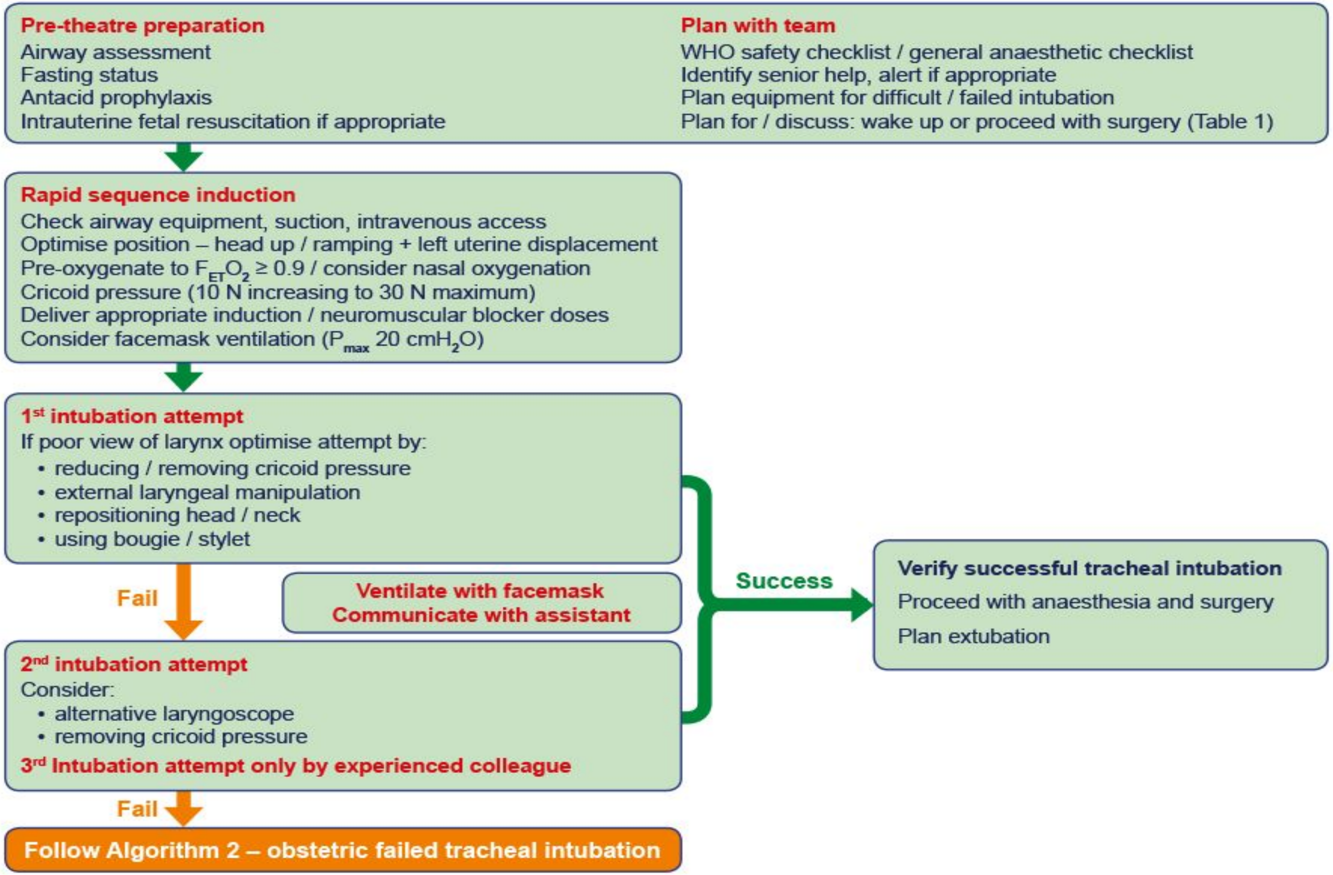
No

Yes

Wake§

Proceed with surgery§

Algorithm 1– safe obstetric general anaesthesia



Pre-theatre preparation
Airway assessment
Fasting status
Antacid prophylaxis
Intrauterine fetal resuscitation if appropriate

Plan with team
WHO safety checklist / general anaesthetic checklist
Identify senior help, alert if appropriate
Plan equipment for difficult / failed intubation
Plan for / discuss: wake up or proceed with surgery (Table 1)

Rapid sequence induction
Check airway equipment, suction, intravenous access
Optimise position – head up / ramping + left uterine displacement
Pre-oxygenate to $F_{ET}O_2 \geq 0.9$ / consider nasal oxygenation
Cricoid pressure (10 N increasing to 30 N maximum)
Deliver appropriate induction / neuromuscular blocker doses
Consider facemask ventilation (P_{max} 20 cmH_2O)

1st intubation attempt
If poor view of larynx optimise attempt by:
- reducing / removing cricoid pressure
- external laryngeal manipulation
- repositioning head / neck
- using bougie / stylet

Fail

Ventilate with facemask
Communicate with assistant

2nd intubation attempt
Consider:
- alternative laryngoscope
- removing cricoid pressure

3rd Intubation attempt only by experienced colleague

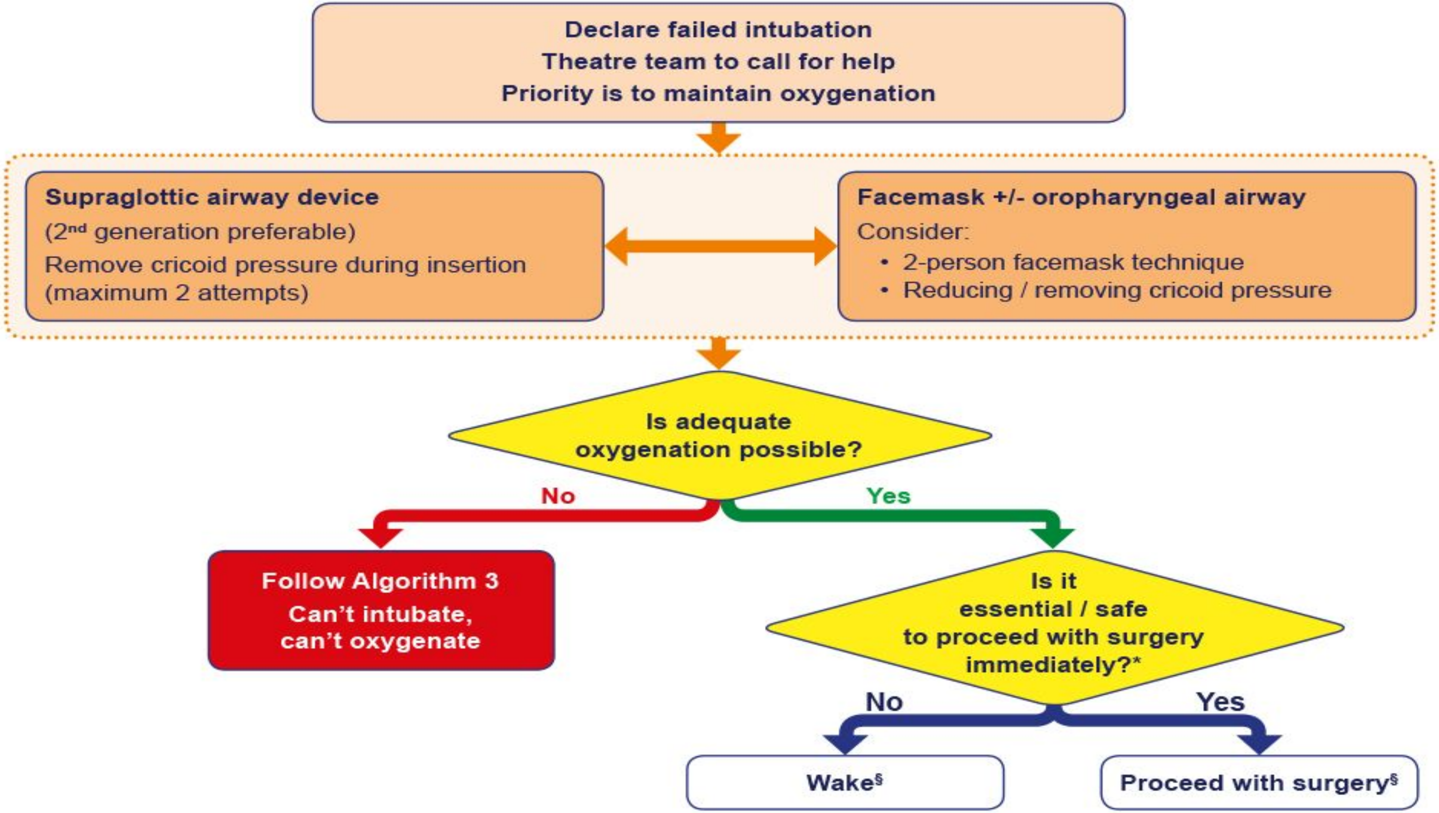
Fail

Follow Algorithm 2 – obstetric failed tracheal intubation

Success

Verify successful tracheal intubation
Proceed with anaesthesia and surgery
Plan extubation

Algorithm 2 – obstetric failed tracheal intubation



Declare failed intubation
Theatre team to call for help
Priority is to maintain oxygenation

Supraglottic airway device
(2nd generation preferable)
Remove cricoid pressure during insertion
(maximum 2 attempts)

Facemask +/- oropharyngeal airway
Consider:
- 2-person facemask technique
- Reducing / removing cricoid pressure

Is adequate oxygenation possible?

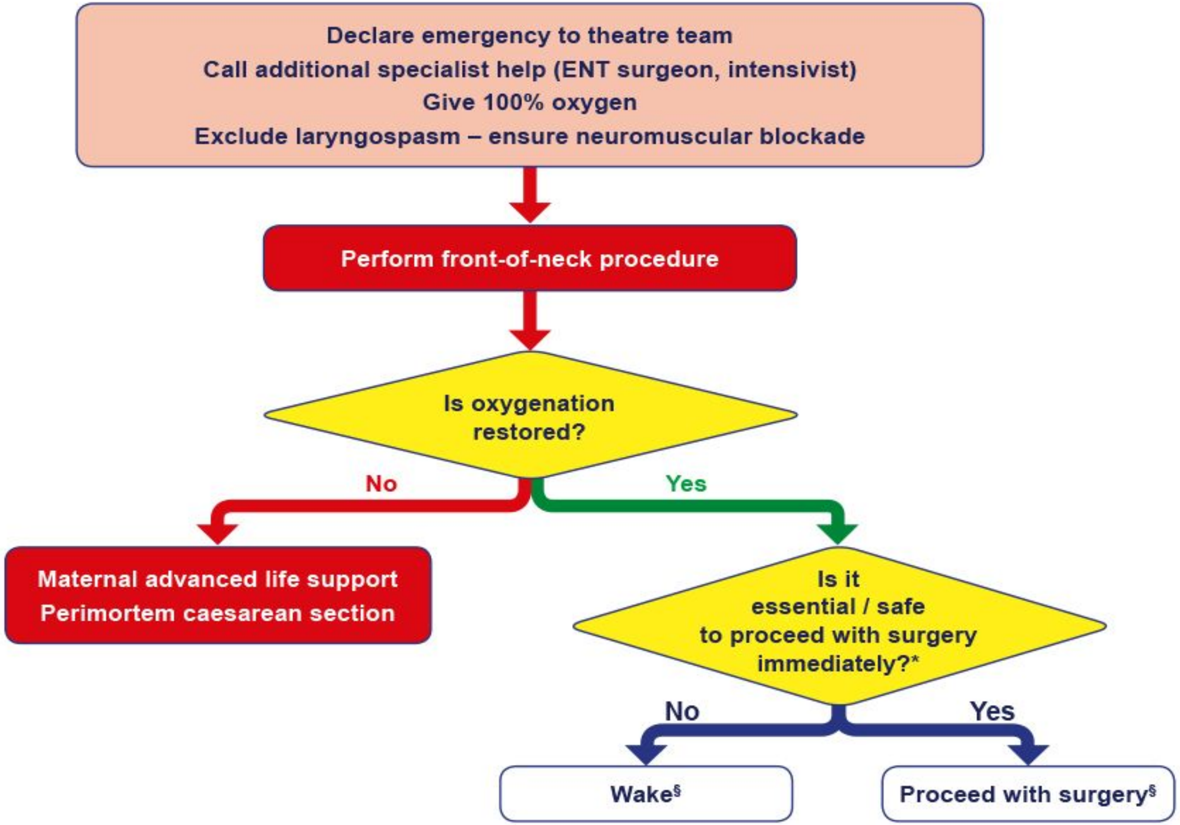
Follow Algorithm 3
Can't intubate, can't oxygenate

Is it essential / safe to proceed with surgery immediately?*

Wake§

Proceed with surgery§

Algorithm 3 – can't intubate, can't oxygenate



Declare emergency to theatre team
Call additional specialist help (ENT surgeon, intensivist)
Give 100% oxygen
Exclude laryngospasm – ensure neuromuscular blockade

Perform front-of-neck procedure

Is oxygenation restored?

No

Maternal advanced life support
Perimortem caesarean section

Yes

Is it essential / safe to proceed with surgery immediately?*

No

Wake[§]

Yes

Proceed with surgery[§]

Table 1 – proceed with surgery?

Factors to consider		WAKE	↔		PROCEED
Before induction	**Maternal condition**	• No compromise	• Mild acute compromise	• Haemorrhage responsive to resuscitation	• Hypovolaemia requiring corrective surgery • Critical cardiac or respiratory compromise, cardiac arrest
	Fetal condition	• No compromise	• Compromise corrected with intrauterine resuscitation, pH < 7.2 but > 7.15	• Continuing fetal heart rate abnormality despite intrauterine resuscitation, pH < 7.15	• Sustained bradycardia • Fetal haemorrhage • Suspected uterine rupture
	Anaesthetist	• Novice	• Junior trainee	• Senior trainee	• Consultant / specialist
	Obesity	• Supermorbid	• Morbid	• Obese	• Normal
	Surgical factors	• Complex surgery or major haemorrhage anticipated	• Multiple uterine scars • Some surgical difficulties expected	• Single uterine scar	• No risk factors
	Aspiration risk	• Recent food	• No recent food • In labour • Opioids given • Antacids not given	• No recent food • In labour • Opioids not given • Antacids given	• Fasted • Not in labour • Antacids given
	Alternative anaesthesia **• regional** **• securing airway awake**	• No anticipated difficulty	• Predicted difficulty	• Relatively contraindicated	• Absolutely contraindicated or has failed • Surgery started
After failed intubation	**Airway device / ventilation**	• Difficult facemask ventilation • Front-of-neck	• Adequate facemask ventilation	• First generation supraglottic airway device	• Second generation supraglottic airway device
	Airway hazards	• Laryngeal oedema • Stridor	• Bleeding • Trauma	• Secretions	• None evident

Table 2 – management after failed tracheal intubation

Wake

- Maintain oxygenation
- Maintain cricoid pressure if not impeding ventilation
- Either maintain head-up position or turn left lateral recumbent
- If rocuronium used, reverse with sugammadex
- Assess neuromuscular blockade and manage awareness if paralysis is prolonged
- Anticipate laryngospasm / can't intubate, can't oxygenate

After waking

- Review urgency of surgery with obstetric team
- Intrauterine fetal resuscitation as appropriate
- For repeat anaesthesia, manage with two anaesthetists
- Anaesthetic options:
  - Regional anaesthesia preferably inserted in lateral position
  - Secure airway awake before repeat general anaesthesia

Proceed with surgery

- Maintain anaesthesia
- Maintain ventilation - consider merits of:
  - controlled or spontaneous ventilation
  - paralysis with rocuronium if sugammadex available
- Anticipate laryngospasm / can't intubate, can't oxygenate
- Minimise aspiration risk:
  - maintain cricoid pressure until delivery (if not impeding ventilation)
  - after delivery maintain vigilance and reapply cricoid pressure if signs of regurgitation
  - empty stomach with gastric drain tube if using second-generation supraglottic airway device
  - minimise fundal pressure
  - administer H_2 receptor blocker i.v. if not already given
- Senior obstetrician to operate
- Inform neonatal team about failed intubation
- Consider total intravenous anaesthesia

THANK YOU